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Published to advance the Science of cold-blooded vertebrates

CERTAIN MARINE TROPICAL FISHES AS FOOD.

BY J. T. NICHOLS¹ AND L. L. MOWBRAY.²

The senior writer made a visit to Porto Rico in 1914, in the course of a scientific survey of the island conducted by the New York Academy of Sciences in co-operation with the insular government. This visit convinced him that the fisheries resources of the island are by no means utilized to the extent of which they are capable. Compared with those he was familiar with elsewhere, in Cuba, Bermudas, at Key West, and in the Hawaiian Islands, they are little developed. Porto Rican fisheries will doubtless expand with time, mostly along those lines where a beginning has already been made. Whereas, the notes herewith brought together may have little economic value for Porto Rico, they have been assembled for such value or interest as they may have there.

The junior writer has the greatest familiarity with the capture and utilization of tropical fishes, especially in the Bermudas, and has furnished most of the data on that subject; whereas, the senior writer, **having greater** facilities for consulting the literature, is, in **general**, responsible for references and the remainder of this paper. Both writers have studied tropical marine fishes in various waters since their first meeting in Bermuda, fourteen years ago. The fish fauna of Bermuda bears a rather close resemblance to that of Porto Rico, and Porto Rico can doubtless learn from Bermuda things of value in developing its fisheries.

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Ground Sharks (*Carcharhinus*).

These sharks are better food than is generally believed. The U. S. Bureau of Fisheries in Washington has recently been interested in introducing their hides to the market for use as leather, and can furnish interesting information on that subject.

In Bermuda, a hash is made from small ground sharks which is much appreciated by all classes. After the head, viscera, and fins have been removed, the shark is cut into chunks and boiled. Then, the water is drained off, the skin and bones removed, and the meat squeezed into a fine hash. The liver is boiled separately to obtain the oil. Chopped parsley, sage, and thyme are mixed with the meat and sufficient of the liver oil to prevent its burning when stirred over an even fire (about a gill of oil for 10 lbs. of meat), until medium dry. It is then served with boiled sweet potatoes. If the shark is in good condition, the liver is whitish or pinkish, and such individuals are selected for the table, those with small brown livers are rejected as not in such good condition and because the liver will not furnish sufficient oil. Pork is sometimes used as a substitute for the liver oil, but is not as good.

These Bermuda sharks which average eight or ten lbs. in weight, are caught for the market in large quantities off shore in June, July, and August with hand lines, and sell for 12 cents apiece, dressed—which is, of course, much more reasonable than other kinds of fish.

The Edged Shark, *Carcharhinus limbatus*, "Caconetta," is one of the commonest species in Porto Rico. It is five feet or more in length when full grown, has the teeth in the upper jaw rather narrow, similar to those in the lower. Its color is grayish, the fins boldly tipped with black. Concerning it, Evermann and Marsh in "Fishes of Porto Rico" say. "Used as food by the very poor." One of the writers has eaten a steak from a freshly caught specimen in Florida, fried in graham flower, and found it decidedly palatable, and not at all tough. The meat is beautifully white.

The colored population in the South relish shark as food, otherwise it is little eaten in the United States.

According to Dr. L. Hussakof, shark is extensively marketed in Naples, where it is served in the restaurants.

Hammer-head Shark. (*Sphyrna zygaena*) "Cornuda."

This shark which reaches a length of 15 feet or more is generally common in tropical seas. It is considered edible in the

Hawaiian Islands, where it is the shark most frequently seen in the markets (Cobb, Bull. XXIII, U. S. Bureau of Fisheries, 1903). Francis Day in "The Fishes of Malabar," India, (1865), says: "Its flesh is considered very nourishing and is extensively salted."

Saw-fish (*Pristis*), "Pez Sierra".

We do not know of the saw-fish being utilized in America. In Malabar, India, according to Day (Fishes of Malabar, 1865): "The flesh is as much esteemed as that of the sharks. The fins are prepared and sent to China; oil is extracted from the livers, whilst the skins are useful for sword belts or for smoothing down wood."

Whip-ray (*Actobatis narinari*). "Obispo." "Chucho."

Day in "The Fishes of Malabar," India, (1865), says of this species: "Eaten by the natives. Is captured to upwards of six feet in width and the flesh is salted."

Tarpon (*Tarpon atlanticus*).

Though in general sought exclusively for sport, the tarpon is eaten in some parts of Florida.

Needle-fish (*Tylosurus*), "Agujon".

Various species of Needle-fish are found in all seas, but are most abundant in the tropics. The larger species have green bones, which sometimes cause them to be avoided, although they are good food. The European form is commonly exposed for sale in the Copenhagen market. A large kind which occurs in the Hawaiian Islands is a foodfish of importance. Bermuda Needle-fish are caught in seines, or sometimes on light hand lines with a float, and often eaten fried.

Half-beak (*Hemirhamphus brasiliensis*), "Balaju".

In Malabar, India, the roe of a related species is highly prized by Europeans for curry (Day, "Fishes of Malabar," 1865).

Mullet (*Mugil*), "Liza".

In Bermuda, the mullet is commonly served in a stew or chowder with potatoes and cubes of pork. They are taken in

greatest abundance in October and November, at which time, they are with roe and the roes are prepared in the following manner: Several are spread upon a white pine board about two feet long and ten inches wide with sufficient space between them to allow for spreading. A similar board is placed upon them, and as they dry and harden, the weight on the upper board is gradually increased so as not to break the membrane in which the eggs are contained. It takes two or three days to press the roes properly. After pressing they are hung up to dry in the sun. They dry to a leathery consistency and a rich golden brown color, and will keep indefinitely. Roes thus prepared sell for 60 cents to a dollar a pound.

Before being eaten, this dried mullet roe is boiled for a few minutes or steamed, and served with melted butter and a little lemon. This is a very rich dish and considered a great delicacy.

In the Hawaiian Islands, the mullet is an important food fish, and since legendary times there, the market supply has been augmented and conserved by fish ponds which are described fully in "The Commercial Fisheries of the Hawaiian Islands," by John S. Cobb, Bull. XXIII, U. S. Bureau of Fisheries, 1903, p. 746. To quote from that article: "The ponds are found principally in the bays indenting the shores of the islands, the common method of construction having been to build a wall of lava rock across the narrowest part of the entrance to a small bay or bight of land and use the inclosed space for the pond * * * In the sea ponds, the walls are about 5 feet in width and are built somewhat loosely, in order that the water may percolate freely * * * The sea ponds generally have sluice gates which can be raised or lowered, or else which open and close like a door * * * The gate is opened when the tide is coming in and closed when it turns. There is usually a small runway, built of two parallel rows of loosely piled stones, from the gate to about 10 feet into the pond. Since the fish congregate in this runway as the tide is going out, it is very easy to dip out the supply needed for market. Seines and gill nets are also used in taking fish from the ponds, a method which is easy, owing to the shallowness of the ponds. Besides, the fish which come in through the open gates at certain seasons of the year, the owner usually has men engaged in catching young ama-ama [mullet] in the open sea and bays, and transporting them alive to these enclosures, where they are kept until they attain a marketable size, and longer, frequently, if the prices quoted in the market are not satisfactory. It costs almost nothing to keep them as they find their own food in the sea ponds. It is supposed that they eat a fine moss which is quite common there."

Cutlass Fish (*Trichiurus lepturus*), "Machete".

Related species of cutlass fishes are eaten in Malabar, India, (Day, "Fishes of Malabar," 1865).

Queen Trigger Fish (*Balistes vetula*).

This species is skinned and eaten stewed in Bermuda, where it goes by the name of Queen Turbot, and the skin is used for scrubbing.

Trunk Fish (*Lactophrys*), "Chapin". "Toro."

In Bermuda, these fishes are baked in the shell after the viscera have been removed and the fish stuffed as one would stuff a chicken. They are then eaten from the shell with a small fork.

Swell Fishes (*Tetraodontidae*), "Tambor." "Tamboril."

These fishes are not fit for food, many of them being deadly poisonous, and the poison is not destroyed by cooking. The muscle of some, if not all, may be eaten, if the viscera, and especially the roe and liver are carefully removed, but the gain is in no way worth the risk. Bermuda fishermen claim that if offered to a cat they will be eaten and the cat will die or at least be made very ill.

On Poisonous Fish and Fish Poisoning.

Various tropical fishes have the reputation of being at times poisonous. We quote below at length remarks on this subject by L. L. Mowbray in the New York Zoological Society Bulletin, Nov., 1916, pages 1422-1423:

"Much has been said and written about the poisonous fishes of tropical and sub-tropical seas. It is a known fact that among people eating the same species at the same time, even caught in the same locality, some have been poisoned, while others have not. Among fishes eaten by man, the species considered most likely to be dangerous as food during the season from May to October, are the barracuda, two species of kingfish, three species of jack, red rockfish, and tiger rockfish.

"The barracuda (*Sphyræna picuda*), is a pike-like fish inhabiting both shallow and deep water, and is often seen hiding behind the Gorgonias, waiting for its prey.

"The mulleto kingfish (*Scomberomorus regalis*), and the common kingfish (*S. cavalla*), are swift and active, and are among the best of food fishes.

"The jacks (*Caranx hippos*, *C. ruber*, and *C. crysos*), are swift-swimming surface fishes, usually traveling in large schools. Their food consists of the anchovy, pilcher, hog mouth fry, and squid and crabs that live among the Gulf-weed.

"The red rockfish (*Mycteroperca venenosa apua*), and the tiger rockfish or gag (*M. tigris*), live on rocky coral bottoms and often in very deep water. Their food consists of small bottom fishes and crustacea. Both species are captured by hand lines and in traps.

"All of these fishes are carnivorous, preying upon various species of fishes and invertebrates. There is no evidence whatever that they feed at any season upon forms which would render their flesh unwholesome.

"While in the Turk Islands I questioned many fishermen concerning the fishes that were poisonous, the effects of the poison, and at what seasons the fish were most dangerous. Without exception their reports tallied. All agreed that there were two forms of the disease; that the fish from the north side of the Islands were the most dangerous, those from the south side not being so likely to prove poisonous. This seems incredible, as the island of Grand Turk, most densely populated of this group of islands, is only one and a half miles wide, by six miles long, and lies in trade winds and the Bahama current, which move all surface food at a considerable rate to the westward. I consulted Dr. Geogaghan, then the Medical Officer of the Colony, who kindly gave me a description of the symptoms, which he had personally experienced in both forms of the disease.

"Dr. Geogaghan said: 'To my knowledge the common poisonous fish are barracuda, jack and mulleto kingfish. In certain places, for some reason or other, the barracuda is more likely to be poisonous than if caught elsewhere.

"There are two distinct kinds of poisoning from these fishes. The ordinary type is similar to ptomaine, being in the nature of a simple gastroenteritis of an irritative sort. It is characterized by acute spasmodic pain in the stomach, diarrhœa, and vomiting, coming on from ten to twenty hours after eating the fish, and subsiding readily under treatment. There is occasionally headache, usually fever (101 to 102 degrees F.), and a rapid pulse (90 to 100). Generally speaking, it is an acute gastroenteritis.

"The other form is in the nature of a toxemia. I have never seen a case following on the eating of jack, but cannot

be certain on this point. The symptoms are slow to subside, sometimes lasting for months. It starts from two to six days after eating the fish, very seldom less than two, and usually three or four. There is repeated pain of a dull resistant type over the region of the pancreas; constipation; slow aching pains in the joints, especially in the knees and back, without any physical signs; pain behind the eyes and headache, acute irritation of the bladder with frequent burning and tickling sensation.

“The joint pains are called “bone-pains” here, and are similar to the pains of influenza, though more particularly associated with the joints. There is an intense feeling of lassitude and debility and subnormal temperature.

“Naturally clinical cases vary in severity. Occasionally the two forms of poisoning are combined, one following the other. I look on the first as a simple irritative disturbance of the intestine which throws off the irritant in the usual way. The second is a real poisoning of the system. I have had both myself, and it was many months before I was rid of the joint-pains of the second.’

“The Turk Island species described herein are also among the principal food fishes of Key West and the Bermudas, excepting the kingfish, which is seldom taken at Bermuda, and poisoning is unknown in these localities.

“After observing the conditions and the manner in which the fish are handled, I have reached the conclusion that the reason they are poisonous, in one region and not in another, is that in Bermuda and Key West almost all fishing boats have live-wells, and therefore usually bring their fish to market alive, while in the Turk Islands and Bahamas the fish are killed and allowed to remain in the sun until the shore is reached—sometimes five or six hours after they are caught.

“All of the fishes considered poisonous are of soft flesh and rich in gastric juices, and are therefore the most likely to decay quickly; and, when eaten in a partially decayed condition, cause *ptomaine poisoning*. Naturally, some are more poisonous than others. Those caught in the morning are exposed to the sun’s rays much longer, and are therefore much more decomposed.

“The fishes, when examined externally and internally, appeared to be in the finest condition when caught, and I could detect no difference between them and those of Bermuda or Key West. I have seen specimens of Grand Turk Island with the scales standing almost on edge through the decomposing of the flesh, which, forming gases, expanded the fish. These fish are frequently sold from house to house, though caught the day before and in a half putrid condition. It is probable that if,

when caught, the fish were eviscerated and bled,¹ a case of poisoning would be a rarity."

In any tropical climate, proper marketing is an essential factor in fisheries development. We quote a cogent sentence or two from Bulletin No. 1, of the Madras Fisheries Bureau, 1915, pp. 212 to 215. "We must make the best use of what we now catch before proceeding to catch yet larger masses. Of all general foods, fish is most liable to taint, and most poisonous when tainted. * * *

"Hence effort is now being directed in the experimental stations started by the Madras Government to various obvious and simple reforms: Firstly, to the introduction of live cars and live chests, or pens, so that fish can be brought alive to shore and kept in good condition till required; this was a universal custom even in temperate climates till the introduction of cheap ice, and still is in many cases * * * Secondly, fish not kept alive *must be cleaned and washed at sea* and properly stowed; this brings them to shore with a much decreased chance of taint, even if several hours intervene."

¹ A good method of bleeding is to sever the tail while the fish is alive, thus opening the blood vessels on either side of it.